U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Artemisia borealis var. wormskioldii*, (formerly *Artemesia campestris ssp. borealis var. wormskioldii*)

COMMON NAME: Northern wormwood

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: April 19, 2010

STATUS/ACTION
___ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: May 11, 2004
90-day positive - FR date:
12-month warranted but precluded - FR date:
Did the petition request a reclassification of a listed species? NO

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? YES
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? YES
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (*http://endangered.fws.gov/*) provides information on listing actions taken during the last 12 months.

Listing priority change: No
Former LP: ___
New LP: ___
Date when the species first became a Candidate (as currently defined):
October 25, 1999

___ Candidate removal: Former LPN: ____
___ A Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a

proposed listing or continuance of candidate status.

___U Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F Range is no longer a U.S. territory.

___ I Insufficient information exists on biological vulnerability and threats to support listing.

___ M Taxon mistakenly included in past notice of review.

___ N Taxon does not meet the Act's definition of "species."

___ X Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Plant; Asteraceae (aster family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Oregon, Washington

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Washington State

LAND OWNERSHIP
One hundred percent of the known populations are on Federal land. The Klickitat County population occurs on Miller Island and covers about 0.25 acres, managed by the Columbia River Gorge National Scenic Area of the Gifford Pinchot National Forest. The Grant County population occurs on land owned by the Bureau of Reclamation and managed by the Grant County Public Utility District (PUD) along the shore of the Columbia River and on several peninsulas that become "islands" during periods of high water. This Grant County population covers approximately 2.8 acres, and is managed in cooperation with the Washington State Natural Heritage Program.

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BIOLOGICAL INFORMATION:

Species Description

Artemisia borealis var. wormskioldii is a perennial plant in the aster family (Asteraceae). Also commonly known as Pacific sagebrush *A. b*. var. *wormskioldii* is a low-growing plant, generally 15–30 centimeters (cm) (6–12 inches (in)) tall, but may grow up to 40 cm (16 in) in height. This plant has a taproot, and basal leaves are crowded in rosettes. The basal leaves are 2–10 cm (1–4 in) long and divided two or three times in mostly linear divisions. Leaves on the upper stems are similar but smaller and less divided. The stems

and leaves are conspicuously covered with silky hairs. The fruits (achenes) and the enlarged upper ends of the flower-bearing stalks (receptacles) are without hairs. The arrangement of yellowish flowers (inflorescence) on the stem is narrow, and the involucres (bracts at the base of flowers) are about 0.3–0.5 cm (0.1–0.2 in). The flower heads are relatively large. The outer female flowers are fertile, and the sterile disk flowers have undeveloped ovaries (Hitchcock *et al*. 1955; Carlson 1997; Washington Natural Heritage Program and Bureau of Land Management 1999).

Taxonomy

A. b. var. *wormskioldii* was first collected along the Columbia River by David Douglas and described in 1833 by W. S. J. G. von Bessey as *A. b*. var. *wormskioldii*. The variety is distinguished by having larger floral parts than other Artemisia and it is the only Artemisia that flowers in April and May (Caplow 2005). In the 1999, 2001, 2002, and 2004 Candidate Notice of Review (CNOR), the taxon was referred to as *A. campestris* var. *wormskioldii*. In the 2005 CNOR, *A. campestris* ssp. *borealis* var. *wormskioldii* was used, which is now considered to be synonymous with *A. b*. var. *wormskioldii*.

In the Flora of North America (FNA 2006), *A. campestris* ssp. *borealis* has been elevated to *A. borealis*. The Washington Natural Heritage Program (Washington Department of Natural Resources [WDNR]) is currently following this treatment at the species level, and continues to recognize the variety *wormskioldii* (Joseph Arnett, WDNR, Rare Plant Botanist, WDNR, pers. comm. 2007). The variety first described by Bessey in 1833 has been revised many times since, however the current treatment has returned to the original form of *A. b*. var. *wormskioldii*. This species variety is recognized as a valid by the Integrated Taxonomic Information System (ITIS)(ITIS 2009).

Habitat/Life History

A. b. var. *wormskioldii* is restricted to exposed basalt, cobbly-sandy terraces, and sand habitat along the banks of the Columbia River at elevations ranging from 50 to 150 meters (160 to 500 feet). The Klickitat County, Washington, population is found near water level in the crevices of basalt outcrops, compacted cobbly terrace, and sand. The Grant County, Washington, population occurs along the shore of the Columbia River and on several "islands" composed mostly of compacted cobbly terrace (Rush 1999). This population appears to be restricted to an area of compacted cobbles with varying amounts of sand and little, if any, soil development (Carlson 1997).

Historical Range/Distribution

Historically, at least eight populations of *A. b*. var. *wormskioldii* occurred within the range of this variety. This plant was previously collected from sites along the banks of the Columbia River near the mouth of the John Day River in Wasco County, Oregon, to the vicinity of Hood River in Hood River County, Oregon, a distance of 80 kilometers (km) (50 miles (mi)) (Washington Natural Heritage Program and Bureau of Land Management 1999). In previous years, all of the historical locations were surveyed and

no populations were found. It is likely that disturbances due to the construction of several dams and subsequent flooding of habitat resulted in the extirpation of the historical occurrences (Carlson 1997; Rush 1999).

Current Range/Distribution

Currently, *A. b*. var. *wormskioldii* is known from only two sites along the Columbia River, separated by approximately 322 km (200 mi), in Klickitat and Grant Counties, Washington. These two populations were discovered in 1983 (Carlson 1997). Three large hydroelectric dam/reservoir complexes (Priest Rapids Dam, McNary Dam, and John Day Dam) separate the two sites (Carlson 1997; Rush 1999). Both populations are found just downstream of dams where current habitat most resembles historic habitat. There may be little or no suitable habitat between the two known populations because much of the original river bank has been inundated by the construction of the three dams and the use of riprap along the river banks; however, remnant populations may remain (Carlson 1997).

Although potential habitat is found on the Hanford Reach of the Columbia River, surveys of apparently suitable habitat have not detected any *A. b*. var. *wormskioldii* plants. In 2002, intensive surveys of the islands in the Hanford Reach by staff from the Washington Natural Heritage Program and the Hanford Reach National Monument found no additional populations of *A. b*. var. *wormskioldii* (Florence Caplow, Rare Plant Botanist, WDNR, pers. comm. 2002).

Amsberry et al. (2007) investigated outplanting *A. b*. var. *wormskioldii* in Oregon. They found the species not extant in Oregon, and not excessively difficult to cultivate, although some groups of seed may be poor in quality. They also found suitable habitat for outplanting not difficult to select, and that outplanting is possible given improved seed viability. Moderate levels of success were reported in a spring, 2008 reintroduction on different site types near Meyer State Park, Oregon, west of The Dalles, near Rowena. (Kelly Amsberry, Botanist, Oregon Department of Agriculture, OSU, pers. comm. 2009).

Population Estimates/Status

At the Klickitat County site in 1989, 75 plants occupied less than 0.4 hectare (ha) (1 acre (ac) (Kaye 1995). In 1995, Kaye (1995) documented 109 flowering plants. The majority of the plants were found on a sandy substrate above basalt bedrock; 16 plants were found on bedrock. A June 1999 census documented 142 flowering plants (Rush 1999).

Surveys completed at Miller Island in Klickitat County, between 2002 and 2008 show a clear decline in numbers (Table 1.) Demographic monitoring indicates this population declined between 2002 and 2004 and had low population growth rates (0.759 in 2002-2003 and 0.89 in 2003-2004) and small vegetative plants experienced the highest mortality (up to 68 percent) (Caplow 2005). Large reproductive plants were the most significant contributors to seedling recruitment; however, 0.2 seedlings per plant is

extremely low compared to results for the Grant County site (1.4 – 14.7 seedlings per large reproductive plant) (Caplow 2005). If population trends continue at this site, the 25-year extinction probability at the site is 1.0 and extinction will occur within 25 years (Caplow 2005).

Table 1. Reproductive *A. b*. var. *wormskioldii* plants on Miller Island site 2000 – 2009.

Date	# flowering ARBOW - Miller	# flowering ARBOW – Grant Co. (est.)
2000	-	1260+
4/23/02	99	-
5/1/03	78	-
5/6/04	79	-
5/5/05	69	1623-1710
4/27/06	42	-
5/2-3/07	39	1585-1656
5/9/08	35	1022-1084
2009	31	763-764

Sources: J. Arnett, WDNR, pers. comm. 2010; Amsberry et al. 2007, pp 29; Mark Woodward, Biologist, Grant County PUD, pers. comm. 2010.

At the Grant County site, a monitoring project was established in 2001 in the largest subpopulation of 1,260 plants. Within the 31 demographic monitoring plots, 179 *A. b*. var. *wormskioldii* individuals were mapped in 2001, and 150 of these were observed in 2002. In those same plots, 157 individuals of *A. campestris*. var. *scouleriana* were mapped in 2001, and 128 of these were observed in 2002. Fourteen new *A. b*. var. *wormskioldii* seedlings were observed in 2002 after only six seedlings were observed in 2001. Because these plants were not individually monitored it is unclear whether they survived to the next year of monitoring and could be counted as recruitment into the population. Using the demographic data and not the census information, data from 2001 through 2006 indicate a steady decline in the Grant County population (J. Arnett, WDNR, pers. comm. 2006).

Census results from 2007 indicate between 1,585 and 1,656 flowering adults in the main population (Mike Clement, Grant County PUD, pers. comm. 2007). Preliminary demographic results suggest some vulnerability to environmental variability (Caplow 2005). The annual variability of plant reproduction and the number of adult plants is high (Michael Clement, Biologist, Grant County PUD, pers. comm. 2007) indicating that moisture and temperature in any given year is highly variable and that these factors directly affect the ability of plants to produce seed, and for seed to germinate and to survive into a mature flowering plant.

Some possible causes suggested for the decline in adults in 2009 at the Grant County site (Table 1.) are the following:

1. A colder and extended previous winter may have been a factor in lack of growth of adult plants;
2. Higher stream flows in 2008 may have deposited debris along the population's west shorelines where plants previously persisted; and,

3. Herbivores such as Canada geese utilizing the islands and peninsulas in the vicinity of the plants was observed.

In contrast to this decline, the highest seedling count to date was recorded in 2009 at 2,653; increasing from 91 and 44, in 2007 and 2008, respectively (Mark Woodward, Biologist, Grant Co. PUD, pers comm. 2010).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The construction of dams along the Columbia River, and possibly railroad and highway construction resulted in the direct loss of suitable habitat as well as individuals and populations of *A. b*. var. *wormskioldii* (Carlson 1997). Losses of habitat and individuals probably resulted from both disturbances due to dam construction and the resulting inundation. Much of the existing river bank is riprap, which is not suitable habitat (Carlson 1997; Rush 1999).

Erosion by wind and water of the sandy substrate has been observed throughout the Klickitat County site and is causing mortality of adult plants and decreased seedling survival (Caplow 2005). Erosion of the habitat is the primary threat to *A. b*. var. *wormskioldii* at the Klickitat County site (F. Caplow, pers. comm. 2005; R. Dobson, US Forest Service, pers. comm. 2006). In 2006, the burial of plants at the Klickitat County site by deposition of sand was noted (J. Arnett, pers. comm. 2007), indicating the presence of an additional threat when sediments are carried by wind or water.

Recreational use at both the Klickitat County and Grant County sites leads to trampling of plants. The Grant County site has been affected by recreational use, including picnicking, camping, hunting, fishing and vehicular traffic. Although the Grant County site is now entirely fenced to exclude vehicles, the site is still accessible to boats (F. Caplow, pers. comm. 2002) and some walk-in use still occurs (Grant County PUD 2006). Therefore, the fencing at the Grant County site has reduced the threat of trampling, but has not entirely eliminated it. At the Klickitat County site, the *A. b*. var. *wormskioldii* population is immediately adjacent to a beach suitable for landing a boat (Carlson 1997; Rush 1999). The small size of the Klickitat County population and its proximity to the boat landing site make it particularly vulnerable to trampling pressure (F. Caplow, pers. comm. 2005).

Two years of above annual rainfall in 1996 and 1997, high runoff, and likely higher than normal releases of water from the upstream Grand Coulee and Wanapum Dams produced excessively high water levels on the Columbia River at the Grant County population (Rush 1999). The high water levels may have washed away some *A. b*. var. *wormskioldii* plants from the site. Currently uncontrolled runoff occurs very rarely in the system as high flows are used for electricity generation and provide for water releases from the Dams (spilling for listed salmonids).

B. Overutilization for commercial, recreational, scientific, or educational purposes.

There is no evidence that *A. b*. var. *wormskioldii* has been used for commercial or recreational purposes. Several cuttings have reportedly been taken from the Klickitat County population (Carlson 1997); however, there is no evidence that cuttings have been made recently. Overutilization for scientific or educational purposes is not known to occur at either population.

C. Disease or predation.

There is no evidence that disease or predation is a concern for *A. b*. var. *wormskioldii*, although herbivory (cattle grazing) could be a threat. The Klickitat County population was within an area formerly grazed by cattle (Carlson 1997). While the palatability of this variety is not known, some individual plants growing in a very loose substrate (sand) would be easily uprooted by cattle. Disturbance of the habitat by cattle grazing also may have contributed to the increase of nonnative plant species at the Klickitat County site (Carlson 1997). There is no evidence that cattle grazing has occurred at the Grant County site. It is unknown whether the presence of Canada geese (Branta Canadensis) reported in 2009 by Grant County PUD has affected the species at the Grant County location.

D. The inadequacy of existing regulatory mechanisms.

A. b. var. *wormskioldii* is designated as endangered by the states of Oregon and Washington (Oregon Department of Agriculture [OAR 603–073–0070], Washington Natural Heritage Program 2007, WDNR 2007), however, the variety is currently found entirely within Washington State. At this time, there are no existing regulatory mechanisms that provide protection for State listed plants in Washington.

A. b. var. *wormskioldii* is managed as a sensitive species by the U.S. Forest Service (Forest Service), which provides management direction for the Klickitat County population (R. Dobson, pers. comm. 2006). Management by the Forest Service at the Klickitat site includes shared responsibility for monitoring the population with the Washington Natural Heritage Program. The Forest Service annually pulls diffuse knapweed (*Centaurea diffusa*), a noxious weed, from Miller Island (R. Dobson 2006). At the Grant County site, the local PUD, in cooperation with the Bureau of Reclamation (BOR [site manager]), monitors the population annually and removes weeds by hand. The management by the two federal agencies (Forest Service and BOR) and Grant County PUD contribute to the conservation of the species; however, these actions are not sufficient to completely remove threats to the variety.

In 2008, as part of the Federal Energy Regulatory Commission dam re-licensing process, the Grant County PUD was required to complete a conservation plan for *A. b*. var. *wormskioldii*, including an implementation schedule. The plan includes measures to ensure: (1) demographic monitoring annually; (2) provide fencing to control vehicle access at the site; and(3) control of noxious weeds that occur at the site (Grant PUD 2008). The management by the two federal agencies (Forest Service and BOR) and

efforts by the Grant County PUD contribute to the conservation of the species; however, these actions are not sufficient to completely remove threats or reverse the apparent declines in the species.

E. Other natural or manmade factors affecting its continued existence.

In addition to direct loss of habitat as a result of dam construction, the manipulation of water flows by hydroelectric dams is a major threat to this variety. The severity of spring floods has been reduced or eliminated in most years. However, there have been years when populations become inundated for much of their growing season. At the Grant County site, the ground water that supports the plants is at a similar level to the river. Changes in the water level of the river could either desiccate or inundate this population. Manipulated water regimes do not mimic historic water flows, which were not controlled by dams and likely were much higher during the rainy season and lower during late-summer droughts, and may affect the ability of these plants to grow, flower, reproduce, and colonize (Rush 1999). In addition, reduced peak floods and augmented minimum flows often result in the succession from herbaceous to woody vegetation (Toner and Keddy 1997) and may reduce the potential for *A. b*. var. *wormskioldii* to expand into new habitats.

Altered water regimes, as well as recreational uses and grazing, have allowed nonnative plants to invade both sites (Rush 1999). *Centaurea diffusa* (diffuse knapweed), a Washington State class-B noxious weed (RCW 17.10, Chap 16–750) is present and spreading at the Grant County site and was found scattered throughout the Klickitat County site in 2005 (R. Dobson, pers. comm. 2006). Noxious weed species pose a serious threat because they have the ability to displace native vegetation and outcompete native plants for resources (space, water and nutrients).

Linaria dalmatica (dalmation toadflax), another Washington State class-B noxious weed (RCW 17.10, Chap 16–750) is present at the Grant County site (Grant County PUD 2004). As of 2004, it occupied approximately 0.5 acre and is being hand-pulled (Grant County PUD 2004). Once established, *L. dalmatica* spreads quickly via its root system and by seed production. Therefore, *L. dalmatica* represents a serious threat at the Grant County site, as well as to the surrounding upland habitats.

Another nonnative, invasive species, *Melilotus alba* (white sweet-clover), partially shares habitat preferences with *A. b*. var. *wormskioldii* and occupies a small area (< 1 acre) at the Grant County site (Grant County PUD 2004). This species represents a potential threat that may develop over the long term as it begins to compete for resources with *A. b.* var. *wormskioldii*.

The extreme loss of habitat that has resulted in two small, widely separated populations may affect the viability of *A. b*. var. *wormskioldii*. Small isolated populations are more vulnerable to a variety of ecological and genetic factors, as well as naturally occurring random events (Gilpin and Soule 1986; Schemske *et al*. 1994). Stochastic events

associated with highly variable weather, including flooding or drought, could cause extirpation of this variety.

Threats that are increasingly significant in smaller populations are related to the loss of genetic variability due to random changes in gene frequencies (genetic drift). Loss of genetic variability can affect disease resistance, response to climatic change, and reproductively compatible gene combinations (genotypes) (Hamrick and Godt 1996). Small populations are more susceptible to inbreeding, which can lead to reduced fitness of offspring (Lande and Barrowclough 1987; Ledig 1986). Crosses between closely related individuals may lead to reduced seed production due to insufficient numbers of genetically compatible individuals and low seed germination success (Richards 2000).

Both populations are threatened by trampling as a result of recreational use. The peninsula or "islands" at Beverly in Grant County and the boat landing site at Miller Island show signs of trampling of *A. b*. var. *wormskioldii* plants (R. Dobson pers. comm. 2006). Recreational use of the areas associated with each of the populations also serves as a vector to the spread of nonnative plants, which can be transported to the site on boats, footwear, and equipment of recreational users.

Both *Artemisia borealis* var. *scouleriana* and *A. ludoviciana* occur at the Klickitat County site. There may be occasional hybridization of both taxa with *A. b.* var. *wormskioldii* (F. Caplow, pers. comm. 2004).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The Washington Natural Heritage Program, using funding provided under section 6 of the Act, prepared a conservation strategy and monitoring plan for *A. b*. var. *wormskioldii* (Rush 1999). Management objectives include identifying and scheduling management actions that will remove or limit threats to this variety. The primary conservation goals of this plan are to protect existing populations and habitat and to maintain occupied and potential habitat in a condition that will sustain *A. b.* var. *wormskioldii*. Fencing of the Grant County population, active management to remove nonnative, invasive plant species, the collection of seed, and the monitoring of the population have likely contributed to the incremental recovery of the population. The storing of seeds in a Center for Plant Conservation facility allows for testing of the germination potential of the variety and contributes to recovery by producing plants that could be outplanted into each of the populations.

The Washington Natural Heritage Program has obtained funding under section 6 of the Act to prepare a Conservation Agreement with the Forest Service and FWS for the Klickitat County population (F. Caplow, pers. comm. 2005).

The Washington Natural Heritage Program has conducted demographic monitoring of the Klickitat County population from 2002 through 2008. This monitoring effort will continue through at least 2010 in order to adequately identify trends and threats to the population.

Grant County PUD began demographic monitoring and population modeling of *A. b*. var. *wormskioldii* in 2001 and will continue this effort through 2010 (Grant County PUD 2004, 2008). Grant County PUD is also working with the Bureau of Reclamation to reduce the impacts from recreational use by limiting public access to the area by maintaining the fence that was constructed around the largest population of the variety and by discouraging motorized or overnight use of the Beverly peninsulas (Grant County PUD 2004). Grant County PUD has begun implementing weed control (hand pulling) to remove *Centaurea diffusa*, *Centaurea solstitialis* (yellow starthistle)), *Bromus tectorum* (cheatgrass), and *Linaria genistifolia* spp. *Dalmatica* (dalmation toadflax) on the site.

Grant County PUD has collected seed from the population and deposited them into the Center for Plant Conservation facility at the Berry Botanic Garden, Portland, Oregon (T. Dresser, pers. comm. 2004). Grant County PUD and Washington Natural Heritage Program staff collected 20 flowering plants of *A. b*. var. *wormskioldii* and *A. campestris* var. *scoulariana* to compare seed production and viability (M. Clement, pers. comm. 2007). In addition, 16 greenhouse-grown *A. b.* var. *wormskioldii* plants were outplanted within the fenced area at the Beverly site in March 2006. As of June 2007, the plants purposely planted below the elevation of the extant population had survived and showed robust growth forms (M. Clement, pers. comm. 2008).

SUMMARY OF THREATS

Only two widely separated populations exist for this variety. Direct loss of suitable habitat through regulation of water levels in the Columbia River and placement of riprap along the river bank has occurred at both the Klickitat and Grant County sites. Recreational use that results in trampling of plants is a threat at both sites. Competition with nonnative invasive species occurs and is a threat at both sites. Both sites have a small population size that makes them susceptible to genetic drift and inbreeding that could lead to poor seed production and low seed germination success (Richards 2000).

At the Klickitat County site, erosion or deposition of sandy substrate is the primary threat to *A. b*. var. *wormskioldii*. Recreational use at this site is not controlled or minimized through fencing or signage and one heavy-use weekend could extirpate this population or severely trample the plants. Invasion by nonnative plant species is a considerable threat to *A. b.* var. *wormskioldii* at the Klickitat County population.

A major threat to the Grant County population is the reduced water levels in the Columbia River, either through control of the water level at the dams or from lack of water. This change in water levels would likely result in plant desiccation when the water table is below root level for extended periods. Alternately, high water events that require water releases from the dams may flood or inundate this population which could affect the ability of the variety to grow, flower, reproduce or expand into unoccupied habitat.

We find that this species is warranted for listing throughout all its range, and, therefore,

find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status: N/A
Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

The Service completed a Spotlight Species Action Plan for the *Artemisia borealis var. wormskioldii* in 2009. This plan was developed to identify conservation goals and tasks that are needed to improve this species' conservation over the next several years. This plan can be found on the Service's websie at:
http://ecos.fws.gov/docs/action_plans/doc3088.pdf

Klickitat County site:
- Control nonnative, invasive plant species
- Discourage recreational use
- Investigate measures to reduce erosion and deposition of the sandy substrate
- Augment population through seed collection and outplanting
- Continue demographic monitoring through 2010.

Grant County site:
- Initiate dialog with PUD regarding future water control to aid reintroduction
- Develop conservation easement with Bureau of Reclamation
- Augment population through seed collection and outplanting
- Continue demographic monitoring

LISTING PRIORITY

THREAT

Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/population	**3***
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Only two widely separated populations exist for this variety. Because of the relatively small size of the populations and their small spatial distribution, a single disturbance, such as the spread of nonnative, invasive plants or high recreational use, could eliminate one or both populations. Threat levels that would be considered moderate to low for a widespread species likely represent higher threats to these small disjunct populations.

Imminence: High water flows, as occurred in 1996−1997, are random, naturally occurring events that may occur unpredictably and could inundate, uproot or bury plants. During years of low flows when soil water becomes low, desiccation is a threat. There is ongoing human access for recreational purposes that threaten both populations. Invasive nonnative plant species occur at both sites, threatening the variety by competing for space, light and nutrients. Therefore, threats to this variety continue to be imminent.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? YES

Is Emergency Listing Warranted?
NO. Both populations are on Federal land and are being monitored. The Grant County population has been fenced to prevent human access. Although flooding is a threat to both populations, the separation of the two populations by intervening dams and

reservoirs makes it unlikely that both would be entirely destroyed in the same flood event.

DESCRIPTION OF MONITORING

The Washington Natural Heritage program monitors this variety at both sites. The Forest Service also monitors the Klickitat County population. The Grant County PUD also monitors the Beverly population. The Service maintains contact with the responsible agencies and species experts and annually requests their reviews and updates to the candidate assessment forms during the revision process. Relevant literature and data for this variety are obtained principally from contacts with responsible agencies, species experts and their reports. Periodic literature searches for this variety are also ongoing. Because of the limited number of sites, and the few responsible agencies and species experts, this approach is the most effective for monitoring this species.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Washington and Oregon

Numerous contributions to this assessment were provided either directly through personal communications, or through the dedicated work products of WDNR and Oregon Department of Agriculture botanists. *A. b*. var. *wormskioldii* is listed as critically imperiled (S1) by the Washington Natural Heritage Program (WDNR), but receives little protection as such under State law. The riparian and shrub steppe habitat surrounding the species is also considered a "Priority Habitat" under Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005). This strategy is a non-regulatory statewide approach to conservation and describes general and specific problems facing wildlife species, but does not include an assessment of plants.

Indicate which State(s) did not provide any information or comments: N/A

REFERENCES

Personal Communications

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:

Acting Carolyn A. Bohan 5/18/10
Regional Director, Region 1, Fish and Wildlife Service Date

Rowan W Gould
ACTING
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 19, 2010
Conducted by: Tim McCracken, Central Washington Field Office

Reviewed by: Jodi Bush Date: April 30, 2010
Division Manager, Listing and Recovery, WWFWO

Ken Berg Date: May 3, 2010
Manager, WWFWO